

## Breakeven holding periods for tax advantaged savings accounts with early withdrawal penalties

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### Abstract

At what point does an IRA with an early withdrawal penalty accumulate more wealth than a fully taxable investment? This paper models breakeven holding periods, allowing tax rates to change and the annual return to be partitioned into ordinary income, realized capital gains, and unrealized capital gains—each being taxed differently. Breakeven holding periods decrease at a decreasing rate with the return and can be quite short for investors facing declining tax rates. In addition, breakeven points are very sensitive to how the return on the non-IRA investment is taxed, doubling or tripling when the return is taxed as a typical mutual fund rather than taxed as ordinary income. © 2004 Academy of Financial Services. All rights reserved.

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### 1. Introduction

The United States federal government encourages retirement saving through many different tax-advantaged savings programs, such as traditional IRA, Roth IRA, 401(k), and 403(b) accounts. These programs offer tax-deferred accumulation of savings and allow the taxpayer to either contribute to or withdrawal from the account on a tax-exempt basis. They also encourage saving for retirement rather than saving for some other purpose by imposing a penalty (typically 10%) for funds that are withdrawn before reaching age 59.5.<sup>1</sup> Although the early withdrawal penalty encourages an investor to keep funds in a retirement account

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once they have been invested, it may also discourage an investor from saving in the first place.

An important question then for taxpayers considering a tax-advantaged account is how long must funds be invested in a retirement account for the tax advantages to outweigh the 10% penalty should funds need to be withdrawn early. The answer is called the breakeven time horizon, or breakeven holding period. All else equal, savers facing short breakeven time horizons should be more inclined to commit money to a tax-advantaged savings account, and those with longer breakeven time horizons should be more circumspect about saving via a potentially restrictive investment account. In fact, investors with short breakeven holding periods may even choose to use an IRA purposefully for non-retirement investment goals, knowing they would face an early withdrawal penalty.

This paper models the breakeven holding period for tax-advantaged savings accounts with both front-end tax benefits, like the traditional IRA and 401(k) plans, and with back-end tax benefits, like the more recently introduced but ubiquitous Roth IRA. It represents an advance from the existing literature on the topic of breakeven time horizons because the model allows for tax rates to change over the term of the investment from the time funds are invested, through the accumulation phase, and at the time they are withdrawn. This feature is particularly important since evidence indicates that investors are likely to fall into lower tax brackets upon retirement (e.g., Bernheim, Skinner, and Weinberg, 2001). The model also accommodates a taxing scheme in which portions of the annual return are treated as either tax-deferred unrealized capital gain, taxable realized capital gain, or taxable ordinary income. Finally, it considers the relevance of the size of the initial pre-tax contribution. This issue deserves attention since Horan (2003) shows that the relative after-tax accumulations of traditional and Roth IRAs are affected by whether the pre-tax contribution is above or below the after-tax contribution limit.

Several authors have compared the advantages of the traditional IRA and the Roth IRA.<sup>2</sup> Burgess and Madeo (1980), Bogen and Bogen (1982), and O'Neil, Saftner, and Dillway (1983) are among the first to address the breakeven time horizon in the presence of an early withdrawal penalty. Bogen and Bogen (1982) model it by calculating the terminal values of a taxable investment and a tax-deductible IRA investment and solving for the time horizon that makes them equal. They conclude that, even in the presence of the penalty, investors may be better off using an IRA with an early withdrawal penalty than a taxable investment for pre-retirement savings goals, especially for high investment returns.

Doyle (1984) extends their results by developing a model that allows a portion of the return from the investment to be treated as unrealized capital gain and not taxed until the end of the holding period. He concludes that the ability to defer tax liabilities in taxable accounts through unrealized capital gains significantly increases the breakeven holding period compared to Bogen and Bogen's (1982) model. His model, however, has one tax rate for all taxable events and does not distinguish between portions of the returns that are taxed as realized capital gains versus ordinary income. Mano and Burr (1984) compare the after-tax accumulations of traditional IRAs and non-sheltered assets using the simplified tax structure and find evidence supporting the claim that the IRA is often a superior vehicle for accumulating funds for pre-retirement spending goals despite a 10% early withdrawal penalty.

More recently, Prakash and Smyser (2003) follow an approach identical to Bogen and

Bogen (1982). As Benveniste (2003) and Kitces (2003) point out, however, the investment return in the Prakash and Smyser (2003) model is taxed entirely as ordinary income, which may be the approximate case for fixed income investments but is certainly not so with equity or mutual fund investments. In reality, the tax on a portion of investment return may be deferred in the form of unrealized capital gain or may be paid as realized capital gain tax. In addition, although Prakash and Smyser (2003) model the breakeven point for a tax-deductible investment (i.e., one with a front-end tax benefit), their model cannot be applied to a Roth IRA, despite their claim to the contrary. This paper extends the literature on breakeven time horizons by accommodating a more realistic tax structure with separate tax rates for ordinary income and capital gains and allowing tax rates to change over time.

The balance of the paper is structured as follows. Section 2 models the breakeven investment horizon for different types of tax-advantaged savings accounts using realistic tax structures for calculating terminal values of taxable and tax-deferred investments. Section 3 presents scenario and sensitivity analyses to provide investors and financial planners with a sense of how long or short breakeven horizons can be and what affects their length. The effect of changing the size of the early withdrawal penalty, which may be relevant to lawmakers, is examined in Section 4. Section 5 concludes and offers avenues for future research.

## 2. A model for the breakeven time horizon

### 2.1. Traditional IRA with generalized tax structure

The basic approach to determining the breakeven point is to calculate the point at which the after-tax accumulations of a taxable investment and a tax-advantaged investment are equal taking into account an early withdrawal penalty. Horan (2002) draws on the work of Crain and Austin (1997) and shows that the after-tax accumulation of a pre-tax investment ( $I_{BT}$ ) can be expressed as

$$FV_{TX} = I_{BT}(1 - T_o)[(1 + r^*)^n(1 - T^*) + T^*] \quad (1)$$

where

$T_o$  = the investor's initial marginal tax rate upon making the investment;

$r^*$  =  $r - rp_{oi}t_{oi} - rp_{cg}t_{cg}$ , or the annual after-tax return;

$T^*$  =  $t_{cg}(1 - p_{oi} - p_{cg})/(1 - p_{oi}t_{oi} - p_{cg}t_{cg})$ ;

$n$  = the number of years until the investment is sold for withdrawal;

$r$  = the expected pre-tax rate of return on the investment;

$t_{oi}$  = the marginal tax rate on ordinary income over the term of the investment;

$t_{cg}$  = the marginal tax rate on capital gains over the term of the investment;

$p_{oi}$  = the percentage of annual return considered ordinary income; and

$p_{cg}$  = the percentage of annual return considered capital gains.

$I_{BT}(1 - T_o)$  is the after-tax investment. The term in brackets is a future value interest factor that treats a portion of the investment return as ordinary income ( $p_{oi}$ ) and taxes it

accordingly at  $t_{oi}$ . Another portion is taxed as capital gain ( $p_{cg}$ ) and taxed at a different capital gains tax rate,  $t_{cg}$ . The remainder of the annual return is unrealized capital gain, the tax on which is deferred until the end of the investment horizon,  $n$ , at which time the investment is assumed to be liquidated, and the capital gain realized. The amount of the final realized capital gain is equal to the terminal value less the adjusted basis, which is increased by the amount of taxes that have been paid up to that point in time.

It is important to recognize that different parts of the return are treated differently for tax purposes. The returns on many mutual funds, for example, typically have significant components of realized and unrealized capital gains. Because the tax on unrealized capital gains are deferred and realized gains are typically taxed at a low 15% according to the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) of 2003, mutual funds have inherent tax advantages not extant in, say, fixed income securities, which have returns that are entirely taxed as ordinary income.

Horan (2003) introduces a related model to calculate the after-tax accumulation of a traditional IRA.<sup>3</sup> It distinguishes between scenarios in which the pre-tax contribution is less than or greater than the after-tax contribution limit and can be expressed as

$$FV_{Trad} = \min[I_{BT}, L](1 + r)^n(1 - T_n) + \max[0, (I_{BT} - L)(1 - T_o)] \cdot [(1 + r^*)^n(1 - T^*) + T^*] \quad (2)$$

where  $T_n$  is the tax rate upon withdrawal at time  $n$ , and  $L$  is the after-tax contribution limit. An investor can make a pre-tax contribution up to  $L/(1 - T_o)$  in a traditional IRA. Any contribution in excess of  $L$ , however, is taxable and is assumed to be placed in a taxable investment similar to that described in Eq. (1). The first term of Eq. (2) represents the future accumulation of the IRA investment. It is subject to a penalty if funds are withdrawn early. The second term represents the future accumulation of the taxable investment, if any, which is required if the pre-tax investment exceeds the after-tax contribution limit.

An investor is indifferent between a taxable investment and a tax-advantaged investment with an early withdrawal penalty when the accumulation in the taxable investment equals that for the traditional IRA less an early withdrawal penalty of, say,  $\phi$ . Applying the early withdrawal penalty,  $\phi$ , to the first term of Eq. (2) and setting Eq. (1) equal to Eq. (2) produces

$$I_{BT}(1 - T_o)[(1 + r^*)^n(1 - T^*) + T^*] = \min[I_{BT}, L](1 + r)^n(1 - T_n - \phi) + \max[0, (I_{BT} - L)(1 - T_o)][(1 + r^*)^n(1 - T^*) + T^*]. \quad (3)$$

Expressing the breakeven condition in this way allows tax rates to change over time, accommodates a realistic tax structure, and allows for an analysis based on whether the pre-tax contribution,  $I_{BT}$ , is greater than or less than the after-tax contribution limit,  $L$ .

We begin by examining the scenario in which the pre-tax contribution is less than or equal to that the contribution limit (i.e.,  $I_{BT} \leq L$ ). In this case, the second term on the RHS is equal to zero, and  $I_{BT}$  can be divided from both sides, leaving

$$(1 - T_o)[(1 + r^*)^n(1 - T^*) + T^*] = (1 + r)^n(1 - T_n - \phi). \quad (4)$$

Dividing both sides by  $(1 + r)^n$  and  $(1 - T_o)$ , distributing terms, and dividing through by  $(1 - T^*)$  yields a condition for the breakeven time horizon when  $I_{BT} \leq L$  of

$$\left[ \frac{1 + r^*}{1 + r} \right]^n = \frac{(1 - T_n - \phi)}{(1 - T_o)(1 - T^*)} - \frac{T^*}{(1 + r)^n(1 - T^*)}. \quad (5)$$

Because  $n$  is an exponent on both sides of Eq. (5), no closed form solution exists and solving for  $n$  requires an iterative process of trial-and-error.

Interestingly, the scenario in which the pre-tax contribution is maximized, namely  $I_{BT} = L/(1 - T_o)$ , yields the same condition as Eq. (5) for pre-tax contributions less than the contribution limit. For example, substituting  $I_{BT}(1 - T_o)$  for  $L$  in Eq. (3) and dividing both sides by  $I_{BT}(1 - T_o)$  yields

$$\begin{aligned} [(1 + r^*)^n(1 - T^*) + T^*] &= (1 + r)^n(1 - T_n - \phi) \\ &+ T_o[(1 + r^*)^n(1 - T^*) + T^*]. \end{aligned} \quad (6)$$

Subtracting the second term on the RHS and collecting terms produces Eq. (5), indicating that the breakeven time horizon does not depend on the size of the pre-tax contribution. The intuition for this equivalence is that any investment in excess of the contribution limit is assumed to be invested in a taxable instrument, which is treated in the same way as the taxable investment option. Treating them differently would not produce a meaningful comparison. Therefore, our analysis is simplified in that there is no need to consider the size of the investment when determining the breakeven time horizon.

## 2.2. Traditional IRA with simplified ordinary income tax structure

Although the size of the investment does not affect the breakeven holding period, tax structure does. Eq. (5) is the generalized breakeven condition for a sophisticated taxing scheme that distinguishes between ordinary income, realized capital gains, and unrealized capital gains. Sometimes the investment return is fully taxed as ordinary income, resulting in a simplified tax structure in which  $p_{oi} = 1$  and  $p_{cg} = 0$ . In this case,  $T^* = 0$  and  $r^* = r(1 - t_{oi})$ , which simplifies the breakeven condition to

$$\left[ \frac{1 + r(1 - t_{oi})}{1 + r} \right]^n = \frac{(1 - T_n - \phi)}{(1 - T_o)} \quad (7)$$

and permits a direct solution for  $n$ ,

$$n = \ln \left[ \frac{(1 - T_n - \phi)}{(1 - T_o)} \right] / \ln \left[ \frac{1 + r(1 - t_{oi})}{1 + r} \right]. \quad (8)$$

A withdrawal after this period of time results in a higher after-tax accumulation for a traditional IRA with the early withdrawal penalty than the taxable investment. Eq. (8) offers some insights. When the term in brackets on the numerator is equal to one, then the

breakeven time horizon is zero. In other words, when  $(1 - T_n - \phi) = (1 - T_o)$ , an investor should use a tax-advantaged account even if funds are withdrawn immediately incurring a penalty. The same is true when  $(1 - T_n - \phi) > (1 - T_o)$ . In this case, the breakeven time horizon is negative. (Note that for any positive tax rate,  $t_{oi}$ , the fraction in brackets in the denominator is less than one making its natural log negative.) The numerator is positive when the fraction in its bracket is greater than one. When the numerator is positive and the denominator is negative, the breakeven time horizon is negative, and an investor should use a tax-advantaged account even if funds are withdrawn immediately thereby incurring a penalty. The breakeven time horizon is positive when  $(1 - T_n - \phi) < (1 - T_o)$ .

Another way to interpret this relation is that the breakeven point depends on the relative size of the contribution and withdrawal tax rates. As the withdrawal tax rate decreases, the breakeven point decreases, making the traditional IRA more attractive to investors despite an early withdrawal penalty. This result is reasonable because the traditional IRA allows a taxpayer to avoid taxes now in exchange for paying them later. A declining tax rate works to the taxpayer's advantage in this case.

Another interesting relationship is that as  $t_{oi}$  approaches zero, the absolute value of the denominator becomes infinitesimally small and the breakeven holding period becomes infinitely large. This relationship suggests two things. First, the traditional IRA becomes less attractive at low tax rates because its tax advantages would be relatively less valuable. Second, for low tax rates, a small change in the tax rate will produce large changes in the breakeven time horizon. This effect can be seen in the scenario analyses in Section 3.

### 2.3. Traditional IRA with simplified capital gain tax structure

Another simplified tax structure to consider is one in which the entire investment return is in the form of capital gain that is realized and taxed at the end of the period. In this case,  $p_{oi} = p_{cg} = 0$ , which makes  $r^* = r$  and  $T^* = t_{cg}$ . Substituting these values into Eq. (5) and solving for  $n$  yields a breakeven time horizon of

$$n = \ln \left[ \frac{t_{cg}(1 - T_o)}{(1 - T_n - \phi) - (1 - T_o)(1 - t_{cg})} \right] / \ln(1 + r). \quad (9)$$

A withdrawal after this period of time results in a higher after-tax accumulation for a traditional IRA with the early withdrawal penalty than the taxable investment. Eq. (9) yields longer breakeven points than Eq. (8) because deferring capital gains tax until the end of the investment period achieves some of the same tax shelter benefits of the traditional IRA. This relation will become apparent in the scenario analysis that follows.

### 2.4. Roth IRA with generalized tax structure

The early withdrawal penalty for the Roth IRA applies only to earnings, not the initial contribution. Therefore, if the early withdrawal is less the initial contribution, the breakeven time horizon is effectively zero. However, withdrawals in excess of the initial contribution are subject not only to the 10% early withdrawal penalty but ordinary income tax, as well.

This non-qualified distribution tax creates a double penalty when earnings are withdrawn early and can create long breakeven points when withdrawals exceed the initial contribution. When considering the taxes and penalties associated with a complete early withdrawal from a Roth IRA, we find that the contribution is taxed as ordinary income, and earnings that are withdrawn early are taxed as ordinary income and penalized.

The following analysis is similar in spirit to Terry and Goolsby (2003) who analyze the usefulness of Section 529 plans, which are designed for education savings, for retirement savings. The tax structures of Section 529 plans and Roth IRAs are nearly equivalent, and withdrawals for purposes other than education are subject to a similar penalty and income tax as early withdrawals from a Roth IRA. This analysis extends Terry and Goolsby's (2003) work by incorporating a more generalized tax structure.

For a Roth IRA, the after-tax accumulation after paying ordinary income tax and a penalty for early withdrawal on earnings is

$$\begin{aligned} FV_{RothP} &= I_{BT}(1 - T_o)\{[(1 + r)^n - 1](1 - T_n - \phi) + 1\} \\ &= I_{BT}(1 - T_o)[(1 + r)^n(1 - T_n - \phi) + T_n + \phi] \end{aligned} \quad (10)$$

An investor is indifferent between a taxable investment and a Roth IRA with an early withdrawal penalty when Eq. (1) equals Eq. (10). Establishing that equality, dividing both sides by  $I_{BT}(1 - T_o)$  and  $(1 + r)^n$ , and rearranging yields

$$\left[ \frac{1 + r^*}{1 + r} \right]^n = \frac{1 - T_n - \phi}{1 - T^*} + \frac{\phi + T_n - T^*}{(1 + r)^n(1 - T^*)} \quad (11)$$

Eq. (11) requires an iterative process of trial-and-error to solve for the breakeven time horizon. Because  $T_o$  is not present either directly or indirectly in Eq. (11), the breakeven point for the Roth IRA does not depend on the initial tax rate.

### 2.5. Roth IRA with simplified capital gain tax structure

Assuming a simplified tax structure for the Roth IRA in which investments returns are taxed each year as ordinary income does not yield a closed form solution for  $n$ . However, assuming the returns are taxed as capital gains at the end of the period does. In this circumstance,  $p_{oi} = p_{cg} = 0$ , which makes  $r^* = r$  and  $T^* = t_{cg}$ . Substituting these values into Eq. (11) and solving for  $n$  yields a breakeven time horizon of zero in all cases. In other words, an investor is always better off with a taxable investment rather than a Roth IRA with a withdrawal penalty assuming all funds in the Roth IRA are withdrawn early. Recall, withdrawals of initial contributions are neither penalized nor taxed as a non-qualified distribution, making the breakeven time horizon for early withdrawals of only initial contributions effectively zero. But when comparing a complete early withdrawal from a Roth IRA with a taxable investment taxed as capital gain both alternatives are initially taxed; both offer tax deferral during the accumulation phase; and both are taxed as capital gains at the

Table 1  
Breakeven time horizons in years for a traditional IRA with a 10% early withdrawal penalty

	Annual return ( $r$ )						
$T_o$	4%	6%	8%	10%	12%	14%	16%
Panel A: 25% withdrawal tax rate ( $T_n = 25\%$ )							
10%	83.5	56.6	43.2	35.2	29.8	26.0	23.1
15%	65.4	44.4	33.9	27.6	23.4	20.3	18.1
25%	30.1	20.4	15.5	12.6	10.7	9.3	8.2
28%	20.3	13.7	10.5	8.5	7.2	6.2	5.5
33%	5.4	3.7	2.8	2.3	1.9	1.7	1.5
35%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Panel B: 28% withdrawal tax rate ( $T_n = 28\%$ )							
10%	98.8	67.1	51.2	41.7	35.3	30.8	27.4
15%	80.3	54.5	41.6	33.9	28.7	25.0	22.2
25%	42.6	28.9	22.0	17.9	15.1	13.2	11.7
28%	31.7	21.5	16.4	13.3	11.3	9.8	8.7
33%	14.9	10.1	7.7	6.2	5.2	4.6	4.0
35%	8.7	5.9	4.5	3.6	3.1	2.7	2.4

These calculations assume that (A) dividends and capital gains are taxed at 15% through the accumulation phase, and (B)  $p_{oi} = 0.0699$  and  $p_{cg} = 0.4423$ .

end of the investment period. The only difference is the early withdrawal penalty on earnings associated with the Roth IRA, making it less desirable than the taxable investment.

### 3. Results

To provide additional guidance to investors and financial planners, this section calculates breakeven time horizons using average distribution rates of mutual funds for ordinary income and capital gains reported by Crain and Austin (1997) and marginal tax rates established by the JGTRRA of 2003 passed by Congress in May of 2003. According to Crain and Austin (1997) the average distribution rates for ordinary income and capital gains for their sample of growth funds are 6.99% and 44.23%, respectively. That is,  $p_{oi} = 0.0699$  and  $p_{cg} = 0.4423$ .<sup>4</sup> The JGTRRA establishes marginal tax rates of 10%, 15%, 25%, 28%, 33%, and 35%, depending on income. It also sets a 15% tax rate on capital gains and dividend income for taxpayers in all but the two lowest tax brackets.<sup>5</sup> So we assume  $t_{cg}$  and  $t_{oi}$  are equal to 15%.

#### 3.1. Traditional IRAs

Table 1 displays the breakeven time horizons using these inputs for a traditional IRA investment with a 10% early withdrawal penalty for various tax rates and annual returns. Several trends are apparent. According to Panel A, which assumes the withdrawal tax rate is 25%, the breakeven time horizon is quite sensitive to the annual return and decreases at a decreasing rate as the investment return increases. The intuition for this result rests in the fact the value of the tax deferral associated with an IRA is greater as the pre-tax return

Table 2  
Breakeven time horizons in years for a traditional IRA with a 10% early withdrawal penalty

$T_o$	Annual return ( $r$ )						
	4%	6%	8%	10%	12%	14%	16%
Panel A: Return fully taxed as ordinary income at $t_{oi} = T_o$							
15%	21.6	14.7	11.2	9.1	7.7	6.7	6.0
25%	14.8	10.0	7.7	6.2	5.3	4.6	4.1
28%	13.8	9.4	7.1	5.8	4.9	4.3	3.8
33%	12.7	8.6	6.5	5.3	4.5	3.9	3.5
35%	12.3	8.3	6.4	5.2	4.4	3.8	3.4
Panel B: Tax structure for a typical growth mutual fund ( $p_{oi} = 0.0699$ and $p_{cg} = 0.4423$ )							
15%	27.9	18.9	14.4	11.7	9.9	8.6	7.6
25%	32.9	22.3	17.0	13.8	11.7	10.1	9.0
28%	34.7	23.5	17.9	14.5	12.3	10.7	9.5
33%	38.2	25.9	19.7	16.0	13.6	11.8	10.5
35%	36.3	24.6	18.7	15.2	12.9	11.2	10.0
Panel C: Return fully taxed as capital gain at the end of the period ( $p_{oi} = p_{cg} = 0$ )							
15%	39.1	26.3	19.9	16.1	13.5	11.7	10.3
25%	56.0	37.7	28.5	23.1	19.4	16.8	14.8
28%	66.4	44.7	33.8	27.3	23.0	19.9	17.5
33%	135.2	91.0	68.9	55.6	46.8	40.5	35.7
35%**	-	-	-	-	-	-	-

\*\* Breakeven time horizons in this row approach infinity and are unsolvable.

These calculations assume that (A) dividends and capital gains are taxed at 15% through the accumulation phase, and (B) an investor's tax bracket remains unchanged when funds are withdrawn.

increases. Another trend evident in Panel A is that the breakeven time horizon is decreases rapidly as the investor's initial tax rate increases because the initial tax deduction of the traditional IRA is more valuable for high tax bracket investors. In fact, the zero breakeven points for taxpayers in the 35% tax bracket indicate that an investor is always better off using a traditional IRA and paying an early withdrawal penalty as long as the funds can be withdrawn at a 25% tax rate (although this scenario is not very likely).

Similar trends exist in Panel B, which assumes that withdrawn funds are taxed at 28%. The breakeven time horizons are quite short for investors in high tax brackets. Furthermore, the breakeven points in Panel B are substantially higher than those in Panel A, suggesting that it is quite sensitive to the withdrawal tax rate. It should be noted that if an investor stays in the 10% or 15% tax brackets, dividends and capital gains are taxed at only 5%. Because the withdrawal tax rates in this analysis are 25% and 28%, however, it is reasonable to assume that dividends and capital gains are taxed at the usual 15%. It is also important to note that IRA withdrawals after the age of 59.5 are penalty free. Consequently, very high breakeven holding periods in Table 1 have no practical significance because the early withdrawal penalty disappears at age 59.5. In such cases, the IRA account without the penalty dominates the taxable investment, but the taxable investment dominates if IRA funds are withdrawn early.

Table 2 presents breakeven holding periods for different taxing schemes assuming that an investor remains in the same tax bracket from the initial contribution, through the accumulation phase, and at the time of withdrawal. As shown in Panel A, breakeven points are

Table 3  
Breakeven time horizons in years for a traditional IRA with a 10% early withdrawal penalty

	Annual return ( $r$ )						
$T_o$	4%	6%	8%	10%	12%	14%	16%
Panel A: Return fully taxed as ordinary income at $t_{oi} = T_o$							
15%	10.5	7.1	5.4	4.4	3.7	3.3	2.9
25%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28%	9.4	6.4	4.9	4.0	3.4	2.9	2.6
33%	6.1	4.1	3.1	2.5	2.2	1.9	1.7
35%	9.7	6.6	5.0	4.1	3.4	3.0	2.7
Panel B: Tax structure for a typical growth mutual fund ( $p_{oi} = 0.0699$ and $p_{cg} = 0.4423$ )							
15%	11.3	7.7	5.8	4.7	4.0	3.5	3.1
25%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28%	20.3	13.7	10.5	8.5	7.2	6.2	5.5
33%	14.9	10.1	7.7	6.2	5.2	4.6	4.0
35%	27.2	18.4	14.0	11.4	9.6	8.4	7.4
15%**	41.2	27.9	21.3	17.3	14.7	12.8	11.4
Panel C: Return fully taxed as capital gain at the end of the period ( $p_{oi} = p_{cg} = 0$ )							
15%	12.7	8.5	6.5	5.2	4.4	3.8	3.4
25%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28%	26.6	17.9	13.6	11.0	9.2	8.0	7.0
33%	17.5	11.8	8.9	7.2	6.1	5.3	4.6
35%	43.8	29.5	22.3	18.0	15.2	13.1	11.6

\*\* Breakeven time horizons in this row are calculated assuming that dividends and capital gains are taxed at 5%. These calculations assume that (A) dividends and capital gains are taxed at 15% through the accumulation phase, and (B) an investor drops to the next lower tax bracket when funds are withdrawn.

shortest if returns are taxed each year as ordinary income because the IRA tax shelter is most valuable in this case. If a portion of the return is taxed as realized capital gain and unrealized capital gain, as in Panel B, breakeven points lengthen substantially, doubling and tripling in some scenarios. The breakeven points in this panel are longer than those in Panel A because the relative advantage of the IRA tax shelter is greater when the investment is fully taxed as ordinary income as compared to a mutual fund investment that has some inherent tax advantages. When returns are taxed only as capital gain at the end of the investment period, as in Panel C, the breakeven points become even longer and, in some cases, approach infinity because the tax deferral characteristics of the traditional IRA are replicated somewhat by the tax deferral of the unrealized capital gain in the taxable investment. In any case, the breakeven points are sensitive to the assumed tax structure.

To examine the effect of declining tax rates, Table 3 displays breakeven time horizons for investors dropping to the next lower tax bracket when funds are withdrawn. Dropping into a lower tax bracket upon withdrawal is important. According to Panel A of Table 3, the breakeven holding periods can be short when the taxable investment is fully taxed as ordinary income at the investor's initial tax rate,  $T_o$ , which is the case for interest income on fixed income investments. For investors in high tax brackets facing a 10% expected return, the tax shelter of the IRA is relatively valuable and the breakeven time horizons decrease substantially to four years or less. For investors in the 25% tax bracket dropping to the 15% tax bracket, a traditional IRA with an early withdrawal penalty is a superior investment vehicle for any time horizon as indicated by the zero breakeven time horizon.<sup>6</sup>

Table 4  
Breakeven time horizons in years for a Roth IRA with a 10% early withdrawal penalty

	Annual return ( $r$ )						
$t_{oi} = T_n$	4%	6%	8%	10%	12%	14%	16%
Panel A: Return fully taxed as ordinary income at $t_{oi} = T_n$							
10%	48.3	33.0	25.3	20.7	17.6	15.4	13.8
15%	36.5	24.9	19.2	15.7	13.4	11.8	10.5
25%	26.6	18.3	14.1	11.6	9.9	8.7	7.9
28%	25.1	17.3	13.3	11.0	9.4	8.3	7.4
33%	23.4	16.1	12.4	10.2	8.8	7.7	7.0
35%	22.9	15.7	12.2	10.0	8.6	7.6	6.8
Panel B: Tax structure for a typical growth mutual fund ( $p_{oi} = 0.0699$ and $p_{cg} = 0.4423$ )							
10%	34.6	23.7	18.3	15.0	12.8	11.2	10.1
15%	62.8	42.8	32.8	26.7	22.7	19.9	17.7
25%	116.2	78.9	60.3	49.1	41.7	36.4	32.4
28%	132.7	90.2	68.9	56.1	47.6	41.5	36.9
33%	161.7	109.8	83.9	68.3	57.9	50.5	44.9
35%	173.9	118.1	90.2	73.4	62.3	54.3	48.3

These calculations assume that dividends and capital gains are taxed at 15% through the accumulation phase.

Panel B contains results assuming the investment is a mutual fund with average distribution rates for ordinary income and capital gains. Again, breakeven points in this panel are longer than those in Panel A, suggesting that the tax structure of the non-IRA investment is important in determining the breakeven point. The last row of Panel B, displays breakeven time horizons when dividends and capital gains are taxed at 5% as is the case for taxpayers remaining in the 15% and 10% tax brackets. They are much longer since the diminutive tax rate for the taxable investment approximates the tax deferral associated with the traditional IRA.

Breakeven time horizons when the investment return is fully taxed as a capital gain at the end of the investment period are displayed in Panel C. They are slightly longer than those in Panel B because the taxable investment in this case offers significant tax deferral characteristics. The differences are not large, however. Panel A and Panel C represent different extremes for the taxable investment. For most investors, the actual taxing scheme would fall somewhere between these two extremes.

The breakeven time horizons in Table 3 do not follow a predictable pattern with respect to the initial tax rate. Rather, breakeven points are influenced more by the difference between the initial and withdrawal tax rates. When the increment to the next lower tax bracket is large, breakeven time horizons are short and vice versa, indicating once again that changing tax rates are important.

### 3.2. Roth IRAs

Table 4 displays breakeven holding periods for a Roth IRA assuming a total early withdrawal of contribution and earnings. Recall that early withdrawals less than the initial contribution are not penalized or taxed but that earnings are subject to the 10% early withdrawal penalty as well as income tax as a non-qualified distribution. In Panel A, returns

are assumed to be fully taxed as ordinary income at a rate of  $T_n$  during the accumulation phase. The breakeven time horizons are significantly longer than those associated with traditional IRAs because earnings associated with early withdrawals from Roth IRAs are taxed as ordinary income in addition to being penalized whereas qualified withdrawals are neither taxed nor penalized.

Panel B presents some very long breakeven points for returns taxed as a typical growth mutual fund, especially for investors in high tax brackets. Recall that IRA withdrawals after the age of 59.5 are penalty free. Consequently, very high breakeven holding periods in Table 4 have no practical significance. The breakeven points are significantly longer than Panel A because the benefits of tax deferral associated with the Roth IRA are relatively less valuable when compared to a mutual fund investment. Furthermore, breakeven points increase with the accumulation phase tax rate rather than decrease as in Panel A. The reason for this interesting contrast is that the tax deferral benefits outweigh the added withdrawal penalty for investors who are taxed heavily on their investment income. Although not displayed in this table, one could use different tax rates for the accumulation and withdrawal phases.

Taken at face value, these results suggest that, in most instances, using Roth IRAs exclusively for non-retirement investment goals is not advantageous. Two factors mitigate this conclusion. First, the Roth IRA has more liberal exclusions from paying early withdrawal penalties. Avoiding the early withdrawal penalty makes the breakeven point zero. Second, the early withdrawal penalty and the non-qualified distribution income tax only apply to withdrawals greater than the initial investment. The analysis above assumes a total withdrawal of funds rather than a partial withdrawal. For a partial withdrawal not exceeding total contributions, the breakeven period for a Roth IRA is essentially zero. On the other hand, withdrawals that exceed the initial contribution have longer breakeven points. If withdrawals are made over time, however, then the early withdrawal penalty may disappear for later withdrawals when the earnings are taken out of the account.

As mentioned in the previous section when the investment return is taxed entirely as capital gains at the end of the investment period, the taxable investment is always better than the Roth IRA. In this case, the breakeven time horizon is zero because the two alternatives have the same tax scheme save for the early withdrawal penalty. Therefore, the taxable investment would always be more attractive when considering an early withdrawal of all Roth IRA contributions and earnings. Partial withdrawals of initial contributions are treated less harshly.

#### **4. The size of the early withdrawal penalty**

The results above indicate that, despite the 10% early withdrawal penalty, individual retirement accounts can be superior to fully taxable investments even for investors with pre-retirement investment goals. If the purpose of the early withdrawal penalty is ensure that these accounts are used for retirement savings, one might conclude that a 10% early withdrawal penalty is not substantial enough to discourage investors from using IRAs for non-retirement purposes. An interesting question then is what effect does the early withdrawal penalty have on the breakeven investment horizon.

Table 5  
Hypothetical breakeven time horizons in years for a traditional IRA with a 20% early withdrawal penalty

$T_o$	Annual Return ( $r$ )						
	4%	6%	8%	10%	12%	14%	16%
Panel A: Constant tax rate ( $T_o = T_n$ )							
15%	46.4	31.5	24.0	19.5	16.6	14.4	12.8
25%	32.1	21.8	16.6	13.5	11.4	9.9	8.8
28%	30.1	20.4	15.5	12.6	10.7	9.3	8.3
33%	27.8	18.8	14.3	11.6	9.8	8.6	7.6
35%	27.1	18.4	14.0	11.4	9.6	8.4	7.4
Panel B: Dropping one tax bracket							
15%	33.6	22.8	17.4	14.1	12.0	10.4	9.3
25%	14.8	10.0	7.7	6.2	5.3	4.6	4.1
28%	24.9	16.9	12.9	10.4	8.8	7.7	6.8
33%	19.8	13.4	10.2	8.3	7.0	6.1	5.4
35%	23.9	16.2	12.3	10.0	8.5	7.4	6.6

These calculations assume that the annual return for the non-IRA investment is fully taxed at  $T_o$ .

Table 5 displays hypothetical breakeven points assuming a 20% early withdrawal penalty and that returns are fully taxed at  $T_o$ . Panel A examines the case when an investor stays in the same tax bracket. To examine the effect of an increase in the early withdrawal penalty on the breakeven time horizon, Panel A of Table 5 should be compared to the Panel A of Table 2. The breakeven holding periods for a 20% early withdrawal penalty are about twice as long as those with a 10% early withdrawal penalty. Panel B presents breakeven points for an investor who drops one tax bracket when withdrawing funds. For a proper comparison, Panel B of Table 5 should be compared to Panel A of Table 3. The breakeven holding periods are about three times longer than those associated with a 10% early withdrawal penalty.

We can surmise then that an increase in the early withdrawal penalty would effectively discourage taxpayers from using an IRA for pre-retirement savings purposes, especially for investors that prefer low risk investments that carry low expected returns and for investors not expecting a significant decline in their marginal tax rate. In fact it can be shown that, holding all else equal, the breakeven time horizon increases at a decreasing rate with respect to the size of the early withdrawal penalty. An increase in the penalty, however, may also discourage investors from saving for retirement, as well.

## 5. Conclusion

Several authors have analyzed the breakeven holding period for a tax-advantaged savings account having an early withdrawal penalty. None, however, has fully considered that an investment's return may have three different components for tax purposes, each treated differently for tax purposes—ordinary income, realized capital gain, unrealized capital gain. This paper develops a model that incorporates this reality and allows tax rates to change from the time a contribution is made through the time of withdrawal.

Through sensitivity analysis, we show that the breakeven holding period is sensitive to the annual return and decreases at a decreasing rate as the return increases. Moreover, the

taxation scheme for the non-IRA investment greatly influences the attractiveness of using an IRA for non-retirement purposes. Breakeven points are substantially longer when a significant proportion of the return on the taxable investment is in the form of either realized or unrealized capital gains as is the case with many equity mutual funds.

For the traditional IRA, the breakeven point is also sensitive to whether tax rates increase or decrease from the time of contribution to withdrawal. Breakeven points can be short (a few years) when investors drop into the next lower tax bracket and returns are high. In contrast, the breakeven investment horizons for the Roth IRA are substantially higher because earnings associated with early withdrawals are taxed as non-qualified distributions in addition to being subject to an early withdrawal penalty.

Because the breakeven holding period for traditional IRAs is sometimes quite short, some investors may find tax-advantaged retirement savings accounts with a 10% early withdrawal penalty useful investment tools for non-retirement purposes. We show that a hypothetical increase in the penalty to 20% dramatically increases breakeven time horizons two to three times, especially for low-risk investors with constant tax rates. If lawmakers were interested in discouraging taxpayers from using an IRA for pre-retirement savings purposes, they might consider increasing the penalty.

The application of this research extends beyond simply traditional IRAs and Roth IRAs. It applies to any tax advantaged savings vehicle with either front-end or back-end tax benefits. However, the model does not take into account differences in early withdrawal exemptions from one account to the next. For example, the Roth IRA and other back-end loaded tax sheltered accounts typically have more flexibility regarding early withdrawals and contribution limits, which increases the attractiveness of the Roth IRA for non-retirement savings purposes. Also, although this model accommodates changes in tax rates over time, tax rates during the accumulation phase are assumed constant. If tax rates change during the accumulation phase, the model may not provide good guidance.

Finally, this paper calculates breakeven holding periods assuming funds are withdrawn from an IRA account as a lump sum. Previous research indicates that the after-tax present value of an IRA depends on the anticipated withdrawal pattern from the account. For example, an annuitized withdrawal pattern dramatically increases the present value of a tax-advantaged account (see Horan, 2002) and would dramatically affect the breakeven analysis. These issues are fruitful areas for future research. In any case, it can be used in a diverse set of circumstances and can provide valuable insights for investors, financial planners, and lawmakers.

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### **Notes**

1. The criteria for the early withdrawal penalty are not the same for all tax-advantaged accounts. For example, the Roth IRA has more liberal withdrawal policies than the

traditional IRA that exempt an investor from the penalty, such as withdrawals for a first time home purchase or paying for an education.

2. See Crain and Austin (1997), Horan, Peterson, and McLeod (1997), Krishnan and Lawrence (2001), Horan and Peterson (2001), and Horan (2003) for examples of how the recent literature has developed.
3. For brevity and clarity, this paper uses the terms “traditional IRA” and “Roth IRA.” The model is actually more general in that it applies to any tax-advantaged account with front-end or back-end tax benefits, respectively.
4. The results are qualitative similar using the average distribution rates for growth and income funds ( $p_{oi} = 0.2046$  and  $p_{cg} = 0.4536$ ).
5. For taxpayers in the 10% and 15% tax brackets, the JGTRRA of 2003 reduces the tax rate on dividends and capital gains to 5%.
6. The algebraic reason for these zero breakeven points is that the first coefficient in Eq. (8) becomes zero in this instance.

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